

PLAPC

PARISI LAW ASSOCIATES, P.C.

**APPLICATION FOR REVIEW OF
DEVELOPMENT OF REGIONAL IMPACT
(Cape Cod Commission)
FOR WIRELESS COMMUNICATIONS FACILITY**

SUPPLEMENT No. 2

Applicant: Vertex Towers, LLC
Site Id: VT-MA-3155D
Property Address: 737 Gifford Street, Falmouth, MA02540
Tax Assessor: 27-01-007
Property Owner: G. Howard Hayes, Trustee of the Falmouth Self Storage Nominee Trust
Date: July 24, 2024

1. Supplemental RF Report of C2 Systems, LLC on behalf of Verizon Wireless
2. Supplemental RF Report of JNaerowaves on behalf of Vertex Towers, LLC

Respectfully submitted,



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July 15, 2024

Cape Cod Commission
3225 Main Street
Barnstable, MA 02630

**SUBJECT: VERTEX TOWERS / 737 GIFFORD STREET TELECOMMUNICATIONS FACILITY
RF ANALYSIS OF TOWER HEIGHT – VERIZON WIRELESS**

To Whom It May Concern:

In response to questions and comments regarding the coverage impact of a lower tower height than proposed, this letter and the RF coverage maps attached hereto are submitted on behalf of Verizon Wireless as it relates to their wireless network in the area. The RF Report dated January 2, 2024 and included with the application includes maps labeled as Attachments A – G. For continuity, the maps included here are sequentially labeled as an extension to the initial set of attachments in that RF Report.

As noted in the RF Report, antenna height is a critical design consideration for meeting the coverage and capacity needs of the network. These specific needs along with the unique topography and land use characteristics surrounding a particular location require that each location undergo its own analysis to determine the optimal and minimum height necessary. In general, and in relation to the area topography, higher antenna height allows for better coverage over terrain obstructions located closer to the site, whereas higher heights may offer virtually no coverage improvement in many cases over terrain obstructions located in more distant areas (over 1 mile or so).

Below is a description of the four coverage maps attached hereto, which quantify the differences in RSRP (Reference Signal Receive Power) by comparing antenna centerline heights of 125' to 105' AGL (above ground level), and then 125' to 85' AGL, at both the 700 MHz and 2100 MHz frequency bands in use by Verizon for its LTE network. LTE service will adapt the signal modulation to each user based on how "clean" the received signal is. Stronger RSRP allows for a cleaner signal, which translates into better service, and increased data rates to both the individual user and to the site itself.

- **Attachment H** titled *Falmouth 7 MA – 700 MHz LTE RSRP Delta (125' – 105')* shows the difference RSRP by comparing 125' and 105' AGL at 700 MHz. As indicated by the legend, the 125' height offers a coverage improvement of 2-4 dB and small areas of 4-6 dB to the north along Gifford Street, Locustfield Road, and in particular to the Falmouth High School. Improvements of 2-4 dB are seen to the east, west and south of proposed site. Please note that the areas immediately around the site that appear to be a decrease in coverage at the higher height are related more to remnants of the antenna pattern than due to the antenna height.
- **Attachment I** titled *Falmouth 7 MA – 700 MHz LTE RSRP Delta (125' – 85')* is similar to Attachment H but compares 125' and 85' AGL antenna heights. As expected, the losses are much greater when dropping down to 85' than 105' as previously shown. This map shows that the



Falmouth High School would suffer losses of over 8 dB, and varying losses between 2 – 8 dB throughout much of the area.

- **Attachment J** titled *Falmouth 7 MA – 2100 MHz LTE RSRP Delta (125' – 105')* shows the difference in RSRP at 2100 MHz by comparing 125' to 105'. While there are differences of 4-6 dB in some areas, the overall impacts between these two heights appear more limited at this frequency band.
- **Attachment K** titled *Falmouth 7 MA – 2100 MHz LTE RSRP Delta (125' – 85')* compares the 2100 MHz coverage of 125' to 85'. The losses increase to over 8 dB to many areas, and there is a much broader area that is negatively impacted by going down to 85'.

Any comparison of different antenna heights will yield some degree of differences in coverage and is why being “first to market” on a tower can be a competitive advantage for one wireless operator over others located lower on the same tower. The impact of these different heights is unique from site to site and dependent on the surrounding topography and land use. While coverage differences between antenna heights within 20' or 40' of each other can be minimal with towers on the order to 180' tall, the impacts are usually more pronounced with shorter towers since they are closer to the height of surrounding obstructions such as trees, buildings, etc.

Based on the analysis presented in the RF Report along with the additional analysis presented here, we've concluded that the proposed tower height is at the minimum to meet the specific needs of Verizon Wireless with antennas located at 125' AGL. Furthermore, while the analysis shows degraded coverage when comparing 125' to 105', the potential coverage is still substantial suggesting that the proposed tower could be of benefit for up to three operators (125', 115', and 105') should they have similar design needs as Verizon. The coverage losses seen at 85' would be a significant detriment to key areas such as the Falmouth High School.

To the extent there are any questions related to Attachments H – K, we welcome any inquiries in the interim and will attempt to address them prior to or during the next meeting presently scheduled for July 30, 2024.

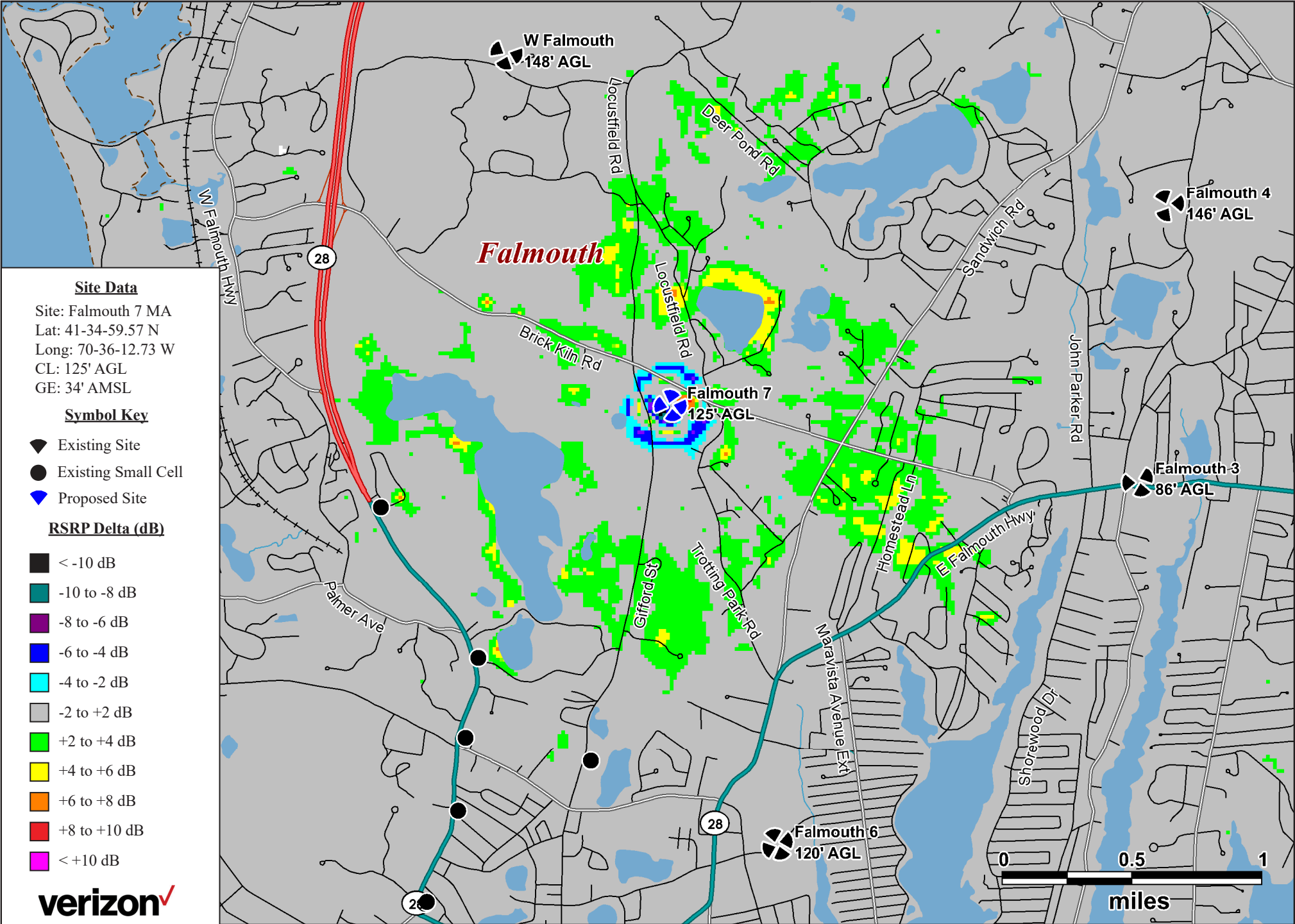
Sincerely,

A handwritten signature in black ink that reads "Keith Vellante".

Keith Vellante
RF Engineer
C Squared Systems, LLC
Contractor to Verizon Wireless

Enclosures (4)

Attachment :
Falmouth 7 MA - 700 MHz LTE RSRP Delta (125' - 105')



Site Data

Site: Falmouth 7 MA
 Lat: 41-34-59.57 N
 Long: 70-36-12.73 W
 CL: 125' AGL
 GE: 34' AMSL

Symbol Key

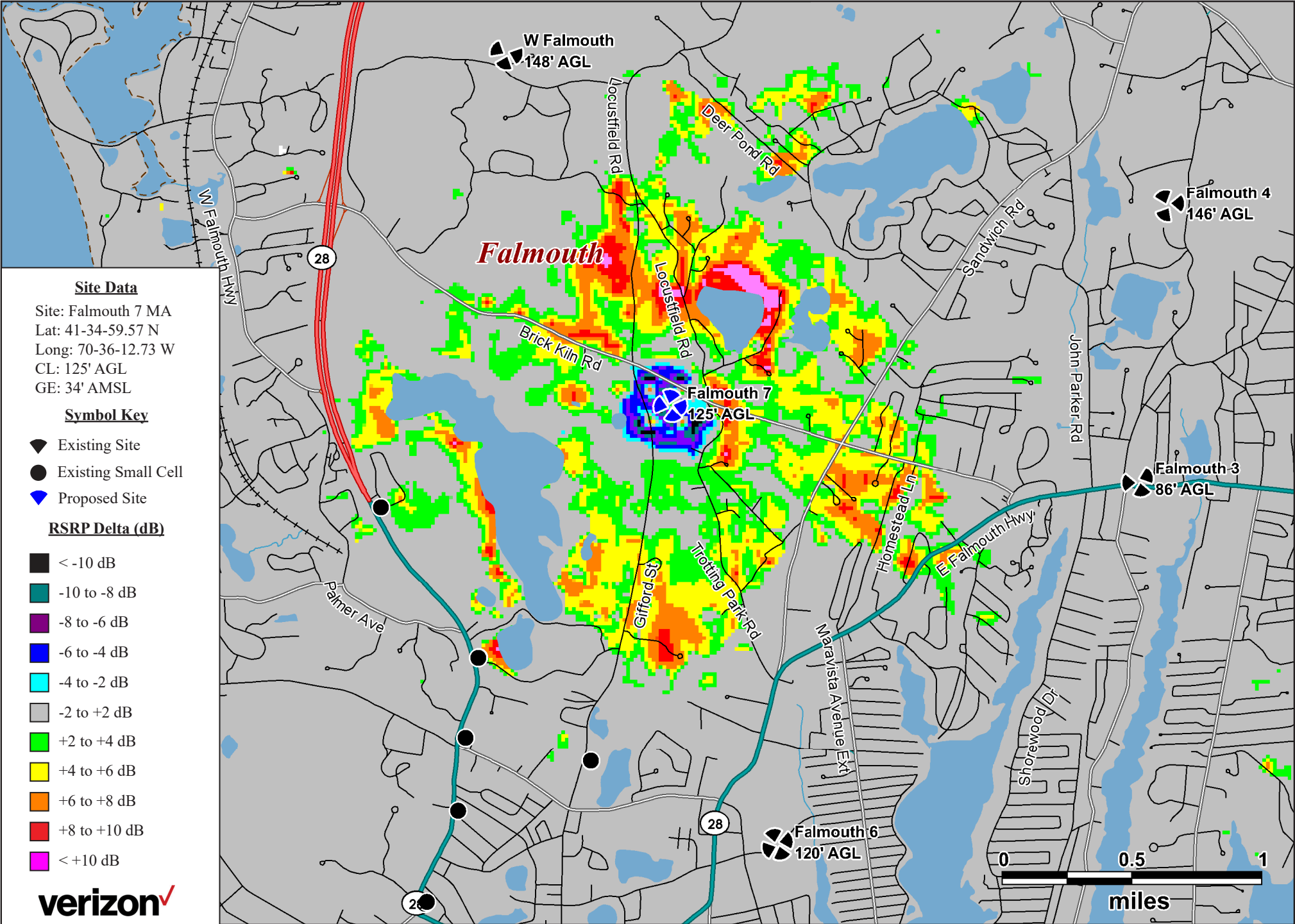
- Existing Site
- Existing Small Cell
- Proposed Site

RSRP Delta (dB)

- < -10 dB
- 10 to -8 dB
- 8 to -6 dB
- 6 to -4 dB
- 4 to -2 dB
- 2 to +2 dB
- +2 to +4 dB
- +4 to +6 dB
- +6 to +8 dB
- +8 to +10 dB
- < +10 dB



Attachment :
Falmouth 7 MA - 700 MHz LTE RSRP Delta (125' - 85')



Site Data

Site: Falmouth 7 MA
 Lat: 41-34-59.57 N
 Long: 70-36-12.73 W
 CL: 125' AGL
 GE: 34' AMSL

Symbol Key

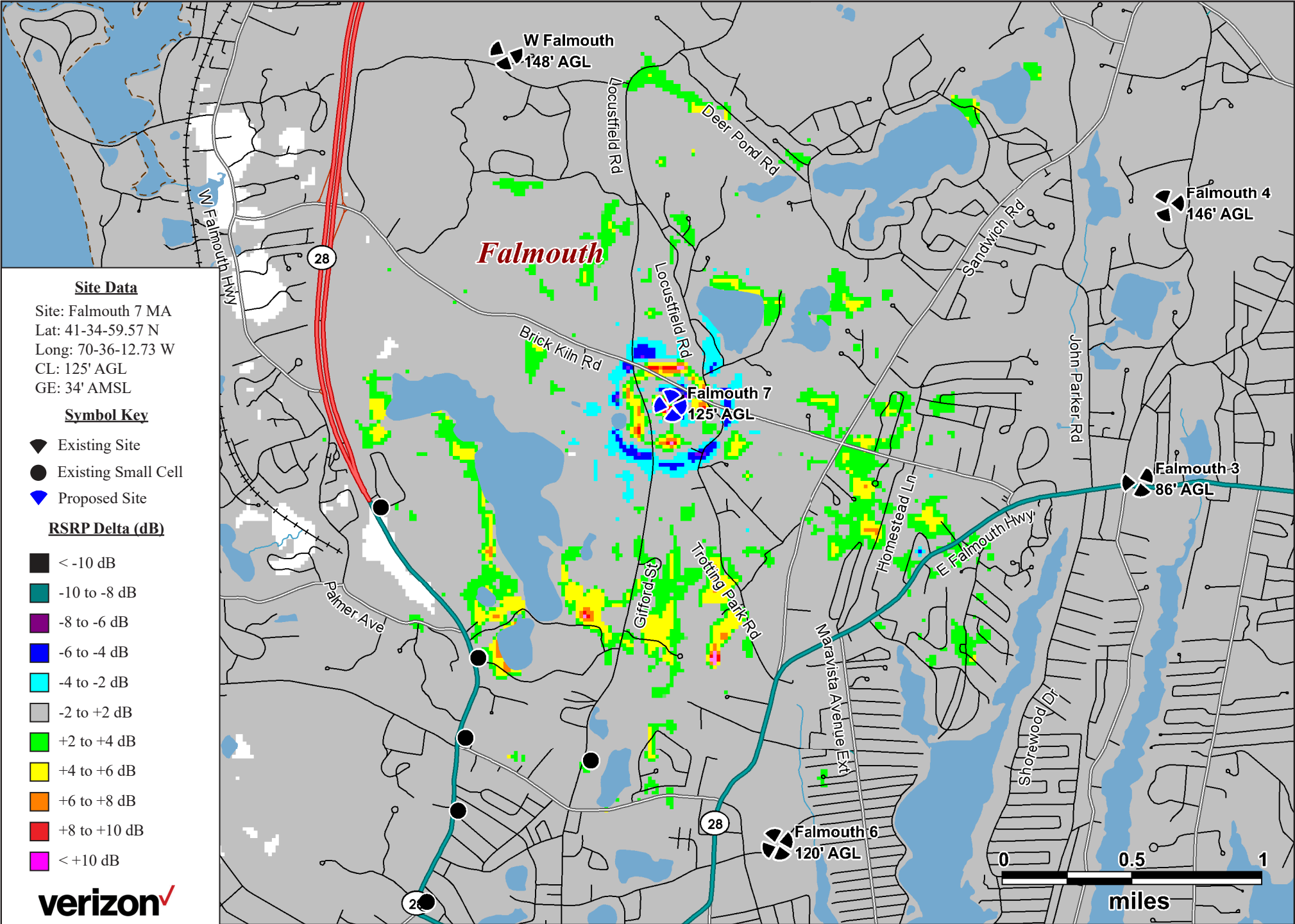
- ◆ Existing Site
- Existing Small Cell
- ◆ Proposed Site

RSRP Delta (dB)

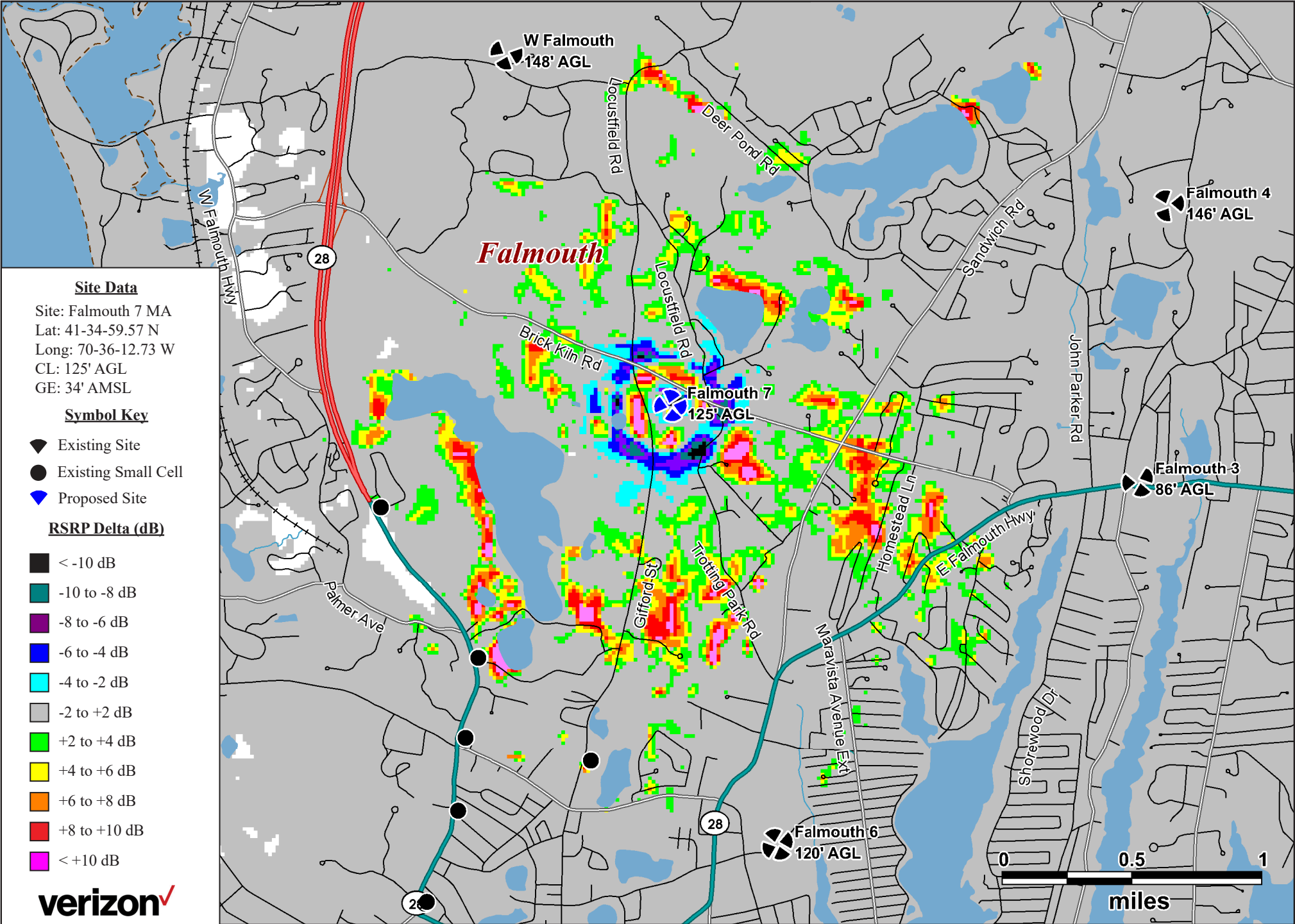
- < -10 dB
- -10 to -8 dB
- -8 to -6 dB
- -6 to -4 dB
- -4 to -2 dB
- -2 to +2 dB
- +2 to +4 dB
- +4 to +6 dB
- +6 to +8 dB
- +8 to +10 dB
- < +10 dB



Attachment :
Falmouth 7 MA - 2100 MHz LTE RSRP Delta (125' - 105')



Attachment :
Falmouth 7 MA - 2100 MHz LTE RSRP Delta (125' - 85')



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AFFIDAVIT OF RF ENGINEER

I, Jose Hernandez hereby state the following in support of the application for Vertex Tower, LLC (“Vertex”) of proposed Monopole at (41.5832, -70.6035), 737 Gifford St, Falmouth, MA 02540. (the “Site”) and the attachment of antennas, cabling and other telecommunications equipment on and at the base of the Monopole by various wireless broadband telecommunications carriers as proposed in the attached application (the “Facility”).

1. I am a currently an independent consultant Principal/Manager Radio Frequency Engineer. I have been involved with the wireless telecommunications industry for 27 years, and have held various technical, operational and supervisory positions with Nextel Communications, T-Mobile, AT&T Mobility and Sprint PCS.
2. In order to satisfy its obligations under its radio licenses acquired from the FCC and under the Code of Federal Regulations 47 C.F.R. § 27.14(a), wireless broadband telecommunications carriers must have in place a system of strategically deployed “cell sites” to provide wireless communications services to their subscribers’ throughout their licensed area. These cell sites generally consist of an antenna support structure such as a telecommunications tower, building, water tank, or other structures used to elevate the antennas to the height necessary for providing adequate service to the targeted area. The antennas are connected via cabling to radio equipment located near the antennas and/or at the base of the support structure. The cell sites operate by transmitting and receiving low power radio frequency signals to and from their subscribers’ portable wireless communication devices such as basic handheld phones, smartphones, PDA’s, tablets, and laptop aircards. These wireless voice and data signals are then transferred through ground telephone lines, fiber, microwave or other means of backhaul transport, and routed to their destinations by sophisticated electronic equipment.
3. Cell sites are a vital and necessary part of carriers’ network infrastructure. In order to maintain effective, uninterrupted service throughout a given area, there must be a series of cell sites, interconnected to each other with slightly overlapping coverage areas. This allows for the subscribers to move freely about a geographic area while maintaining a consistent and reliable wireless connection to the network.
4. A proposed cell site must consider the locations and coverage provided by the surrounding cell sites in the network, and must be located within a limited geographical area, which is defined by factors such as terrain, land use characteristics, and population density. By locating within this limited area and at a sufficient height, the cell site would have a high probability of meeting the targeted objectives, thereby providing reliable coverage and capacity throughout the cell.
5. In compliance with the requirements of its FCC licenses, carriers are actively building their respective networks to provide coverage throughout its licensed area. In order to meet the responsibility of providing seamless, uninterrupted service, carriers must continue to acquire

interest in sites for additional facilities, and is applying for and obtaining local governmental zoning approvals to construct its sites in order to eliminate deficient service areas due to gaps in coverage or insufficient capacity. Any delays severely curtail carriers' ability to satisfy both mandated time requirements, and to achieve a market position that will allow it to compete for customers with other similar companies also issued licenses to operate in this area.

6. Using computer simulations to model radio frequency propagation, Vertex has determined that a wireless transmission facility located at or near to the proposed Facility would facilitate wireless communications within the local area along Brick Kiln Rd, Gifford St, Trotting Park Rd and surrounding areas of Falmouth, MA. These simulations model characteristics such as antenna types, antenna height, output power, terrain, ground elevations and RF propagation effects of the frequency utilized.

7. In my opinion based upon substantial research and analysis, without a cell site located at or very near the proposed site, this area of Falmouth, MA would not meet the typical coverage requirements for multiple wireless carriers, resulting in a substantial gap in wireless coverage.

8. Based upon the technologies currently being deployed by wireless carriers, it is my opinion that the proposed Facility is at the minimum height necessary to satisfy the coverage objectives of multiple wireless carriers providing in the area.

9. All of the transmitter facilities to be located at the proposed location are required to comply, and when constructed and operational will comply with, all applicable regulations of the FCC regarding radio frequency (RF) exposure as detailed in FCC OET Bulletin 65, Edition 97-1.

Signed and sworn under the pains and penalties of perjury, July 22, 2024.

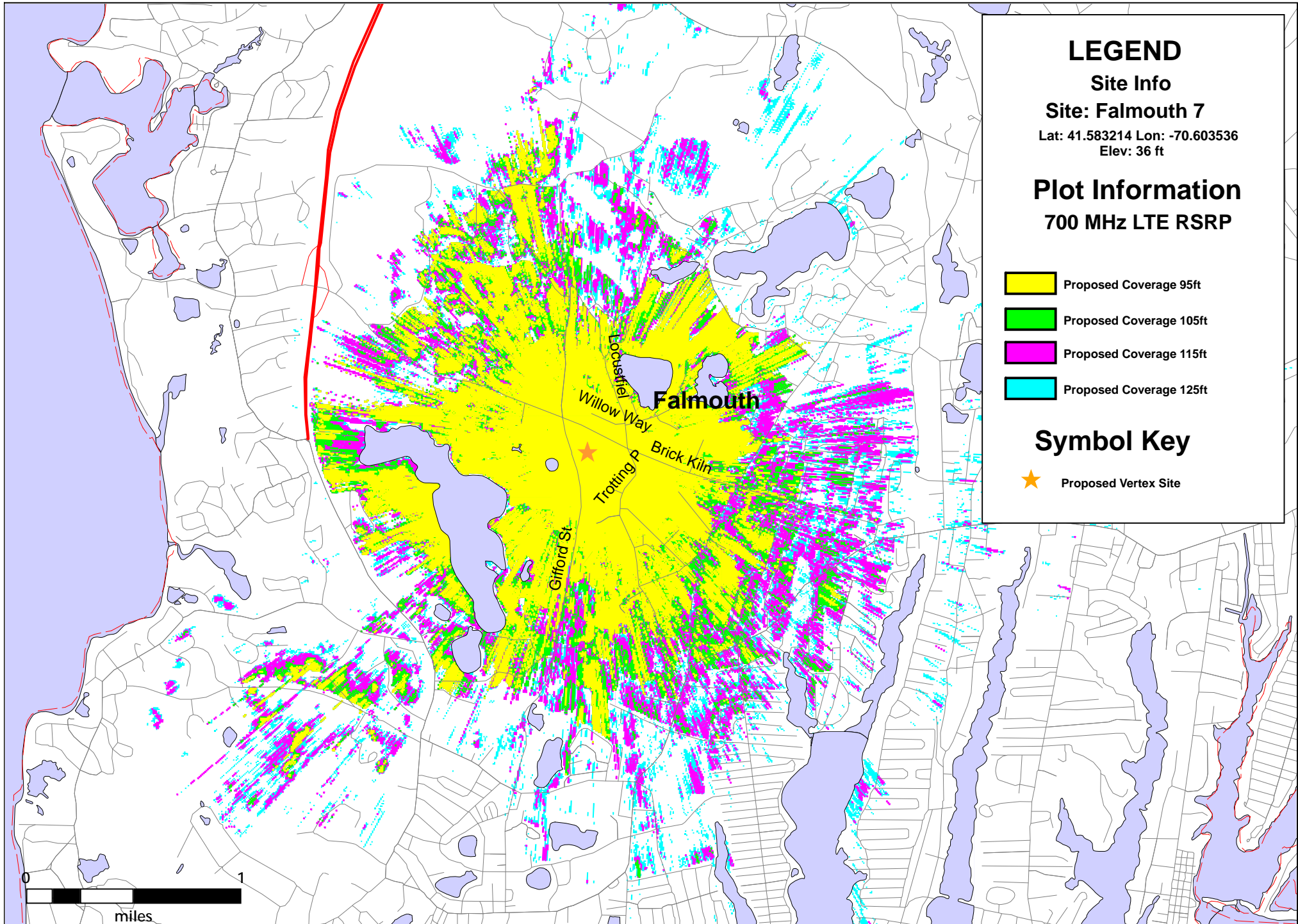
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Jose Hernandez

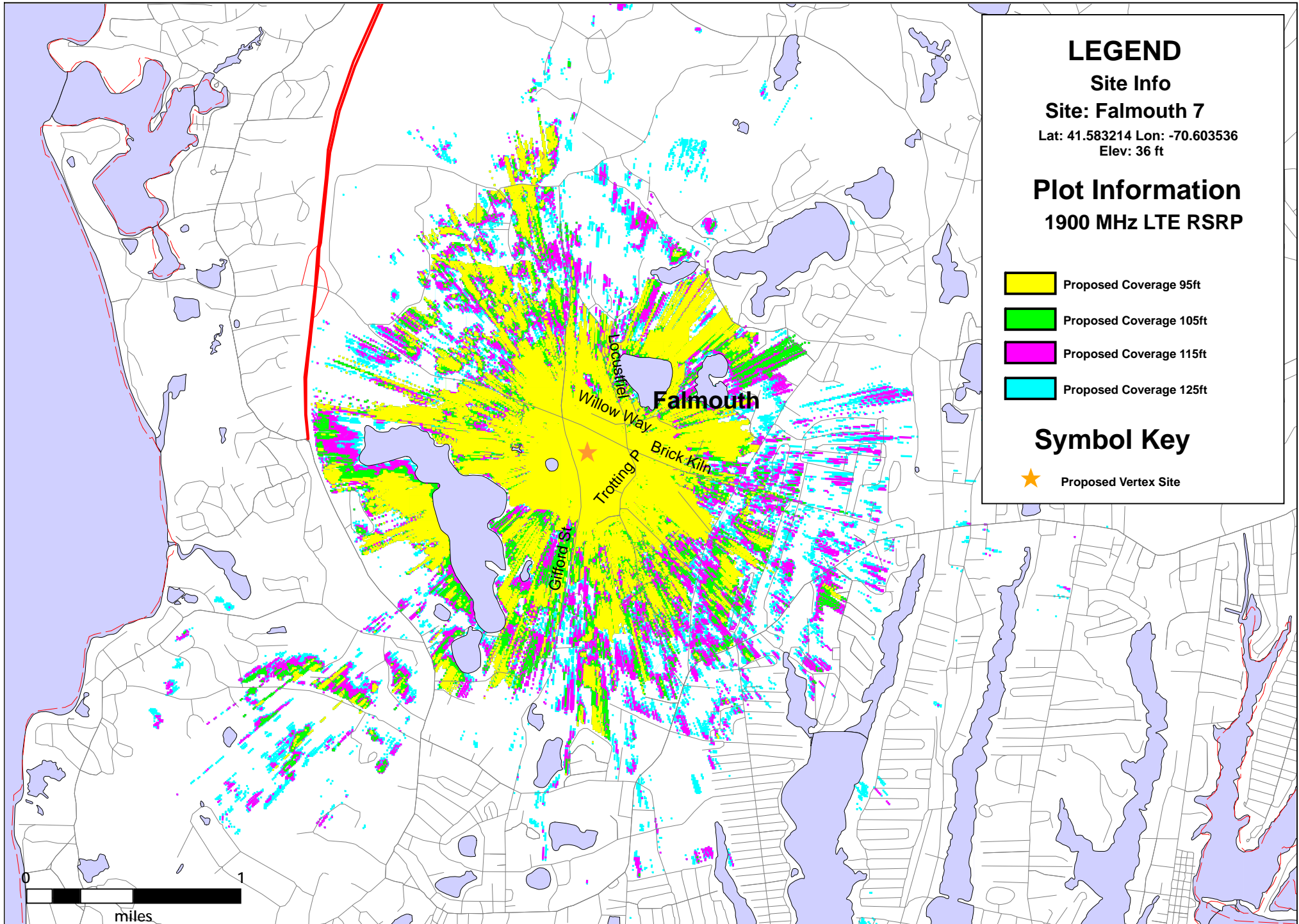
JNaerowaves.Corp

President / Principal Radio Frequency Engineer

RF Height Analysis For Falmouth 7@-95dBm



RF Height Analysis For Falmouth 7@-95dBm



RF Height Analysis For Falmouth 7@-95dBm

